PUBLICATIONS AND WORKING PAPERS

"Effecting a Price Squeeze Through Bundled Pricing," with Steven S. Wildman, Consortium for Research in Telecommunications Policy Working Papers Series, June 1998.

"The Pricing of Customer Access in Telecommunications," with Steven S. Wildman, *Industrial and Corporate Change*, vol. 5, no. 4, 1996, pp. 1029-1047.

"Bonus and Penalty Schemes as Equilibrium Incentive Devices, With Application to Manufacturing Systems," with Pau Olivella, *Journal of Law, Economics, and Organization*, 10, Spring 1994, pp. 1-34.

"Diversification as a Strategic Preemptive Weapon," *Journal of Economics and Management Strategy*, 2, Spring 1993, pp. 41-70.

"Using the Capital Market as a Monitor: Corporate Spin-offs in an Agency Framework," *RAND Journal of Economics*, 22, Winter 1991, pp. 505-518.

"Firm Organization and the Economic Approach to Personnel Management, *American Economic Review*, vol. 80, no. 2, May 1990, pp. 23-27.

"The Introduction of New Products," with Edward P. Lazear, *American Economic Review*, vol. 80, no. 2, May 1990, pp. 421-426.

"Ability, Moral Hazard, Firm Size, and Diversification," *RAND Journal of Economics*, 19, Spring 1988, pp. 72-87.

"Worker Reputation and Productivity Incentives," *Journal of Labor Economics*, vol. 5, no. 4, October 1987, part 2, pp. S87-S106.

"Imitation and Differentiation in New Product Markets," under second review at *RAND Journal of Economics*.

"Competition, Relativism, and Market Choice," with Edward P. Lazear, C.M.S.E.M.S. Working Paper No. 750, October 1987.

"An Empirical Analysis of Agency Theory and the Choice of Merger Partners," mimeo, Northwestern University, August 1987.

"The Role of Managerial Ability and Moral Hazard in the Determination of Firm Size, Growth and Diversification," Ph.D. Dissertation, University of Chicago, August 1985.

RESEARCH IN PROGRESS

"Exclusivity versus Non-Exclusivity in the Licensing of Intellectual Property," with Steven S. Wildman.

"An Empirical Analysis of Corporate Spin-offs in an Agency Framework," (with H. Adams).

"Firm Structure as an Informational Barrier to Entry."

"On the War of Attrition in Markets with Endogenous Cost of Capital."

SELECTED TALKS

"Competitive and Strategic Use of Optional Calling Plans and Volume Pricing Plans," The Institute for International Research Conference for Competitive Pricing of Telecommunications Services, Chicago, Illinois, July 1998.

"The Pricing of Customer Access in Telecommunications," Conference on Public Policy and Corporate Strategy for the Information Economy, Evanston, Illinois, May 1996.

"Diversification as a Strategic Preemptive Weapon," University of Iowa, Iowa City, Iowa, February 1994.

"Diversification as a Strategic Preemptive Weapon, "University of Buffalo, Buffalo, New York, February 1994.

"Diversification as a Strategic Preemptive Weapon," University of Southern California, Los Angeles, California, December 1993.

"Strategic Pricing" Winter Meetings of the Econometric Society, Discussant, Anaheim, California, December 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Michigan State University, Lansing, Michigan, November 1993.

"Diversification as a Strategic Preemptive Weapon," Rutgers University, New Brunswick, New Jersey, November 1993.

"Diversification as a Strategic Preemptive Weapon," University of California at Santa Cruz, Santa Cruz, California, November 1993.

"Diversification as a Strategic Preemptive Weapon," Graduate School of Business, Stanford University, Stanford, California, November. 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Purdue University, West Lafayette, Indiana, September 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Summer Meetings of the Econometric Society, Boston University, Boston, Massachusetts, June 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," University of California, Department of Economics, Berkeley, California, May 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Stanford University, Graduate School of Business, Stanford, California, May 1993.

"Diversification as a Strategic Preemptive Weapon," Stanford University, Graduate School of Business, Stanford, California, April 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Hoover Institution, Stanford, California, April 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," University of California, Graduate School of Business, Berkeley, California, February 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Stanford University, Department of Economics, Stanford, California, February 1993.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," Hoover Institution, Stanford, California, January 1993.

"Pricing Strategies," Session Discussant, 1992 North American Winter Meeting of The Econometric Society, Anaheim, California, January 1992.

"Diversification as a Strategic Preemptive Weapon," University of Toronto, Toronto, Canada, November 1991.

"Diversification as a Strategic Preemptive Weapon," Queen's University, Kingston, Ontario, Canada, November 1991.

"Bonuses and Penalties as Equilibrium Incentive Devices, with Application to Manufacturing Systems," University of Chicago, Chicago, Illinois, June 1991.

"The Timing of Entry into New Markets," Summer Meetings of the Econometric Society, University of Pennsylvania, Philadelphia, Pennsylvania, June 1991.

"Innovation, Imitation, Productive Differentiation, and the Value of Information in New Markets," University of Chicago, Chicago, Illinois, April 1991.

"Bonuses and Penalties as Equilibrium Incentive Devices, with Application to Manufacturing Systems," Winter Meetings of the Econometric Society, Washington, D.C., December 1990.

"Corporate Spin-offs in an Agency Framework," University of Washington, Seattle, Washington, October 1990.

"The Timing of Entry Into New Markets," University of British Columbia, Vancouver, British Columbia, October 1990.

"Corporate Spin-offs in an Agency Framework," Texas A&M University, College Station, Texas, April 1990.

"Firm Organization and the Economic Approach to Personnel Management," Winter Meetings of the American Economic Association, New York, New York, Dec. 1989.

"Corporate Spin-offs in an Agency Framework," Western Finance Association Meetings, Seattle, Washington, June 1989.

"Corporate Spin-offs in an Agency Framework," University of Rochester, Rochester, New York, May 1989.

"Corporate Spin-offs in an Agency Framework," North American Summer Meetings of the Econometric Society, Minneapolis, Minnesota, June 1988.

"Competition, Relativism, and Market Choice," North American Summer Meetings of the Econometric Society, Berkeley, California, June 1987.

"Competition, Relativism, and Market Choice," University of Chicago, Chicago, Illinois, April 1987.

"Rate Reform and Competition in Electric Power," Discussant, Conference on Competitive Issues in Electric Power, Northwestern University, Evanston, Illinois, March 1987.

"Worker Reputation and Productivity Incentives," New Economics of Personnel Conference, Arizona State University, Tempe, Arizona, April 1986.

"Ability, Moral Hazard, and Firm Diversification," Yale University, New Haven, Connecticut, February 1985.

"Ability, Moral Hazard, and Firm Diversification," University of Rochester, Rochester, New York, February 1985.

"Ability, Moral Hazard, and Firm Diversification," Stanford University, Stanford, California, February 1985.

"Ability, Moral Hazard, and Firm Diversification," University of Minnesota, Minneapolis, Minnesota, January 1985.

"Ability, Moral Hazard, and Firm Diversification," California Institute of Technology, Pasadena, California, January 1985.

"Ability, Moral Hazard, and Firm Diversification," Duke University, Durham, North Carolina, January 1985.

"Ability, Moral Hazard, and Firm Diversification," Northwestern University, Evanston, Illinois, January 1985.

"Ability, Moral Hazard, and Firm Diversification," Brown University, Providence, Rhode Island, January 1985.

"Ability, Moral Hazard, and Firm Diversification," Harvard University, Cambridge, Massachusetts, January 1985.

"Ability, Moral Hazard, and Firm Diversification," University of California - Los Angeles, Los Angeles, California, January 1985.

"Ability, Moral Hazard, and Firm Diversification," University of Pennsylvania, Philadelphia, Pennsylvania, December 1994.

REFEREEING

Dr. Aron has served as a referee for *The Rand Journal of Economics*, the *Journal of Political Economy*, the *Journal of Finance*, the *American Economic Review*, the *Quarterly Journal of Economics*, the *Journal of Industrial Economics*, the *Journal of Economics and Business*, the *Journal of Economic Theory*, the *Journal of Labor Economics*, the *Review of Industrial Organization*, the *European Economic Review*, the *Journal of Economics and Management*

Strategy, the *International Review of Economics and Business*, the *Quarterly Review of Economics and Business*, *Management Science*, the *Journal of Public Economics*, the *Journal of Institutional and Theoretical Economics*, and the National Science Foundation.

TESTIMONY

1998 Testimony on behalf of Ameritech Indiana regarding the economics of resale of local exchange services.

1998 Testimony on behalf of Ameritech Illinois regarding a new model and methodology for estimating the cost of unbundled local switching.

1998 Testimony on behalf of Ameritech Michigan regarding the provision of intraLATA toll service to customers of competing basic local exchange service providers.

1998 Testimony on behalf of Ameritech Wisconsin regarding the determination of proper forward looking costs for purposes of determining Federal Universal Service support.

1997 Testimony on behalf of Ameritech in Illinois and Wisconsin in state arbitration proceedings pursuant to the Telecommunications Act of 1996, regarding the issue of limitations of liability in provision of telecommunications services.

1997 Testimony on behalf of Ameritech in three states in proceedings before the state regulatory commissions to determine economic costs of providing unbundled network elements to competitors during the transition to competition pursuant to the Telecommunications Act of 1996.

1996 Testimony on behalf of Ameritech in five states regarding interconnection pricing and competitive issues in arbitration hearings pursuant to the Telecommunications Act of 1996.

1996 Testimony submitted to the Illinois Public Service Commission, on behalf of Ameritech, on the economic interpretation of the 1996 Telecom Act regarding interconnection pricing and costing.

July 1995, Testimony submitted to Michigan Public Service Commission, on behalf of Ameritech Michigan, on efficient pricing of local exchange services.

June 1995, Testimony submitted to Michigan Public Service Commission on "just and reasonable" price increases in local exchange services.

OTHER ENGAGEMENTS

For Ameritech Michigan, Affidavit submitted to the Federal Communications Commission in the matter "Application by Ameritech Michigan for Authorization under Section 271 of the Communications Act to Provide In-Region, InterLATA Service in the State of Michigan."

For Flowers Industries, in the proposed merger between Flowers and Franklin Baking Company. *Analyzed potential efficiencies from the merger, market definition, and potential entry into the relevant geographic market.*

For Optus Vision of Australia, in the proposed merger between Australis and Foxtel. *Analyzed the competitive effects in the Australian pay TV industry of the proposed merger. Specifically analyzed issues of market power in the cable television industry with respect to cable TV programming and the ease of entry and exit.*

The Appraiser's Coalition, et. al, v. Appraisal Institute, et. al, Civil Action No. 93 C 913, U.S. District Court, Northern District of Illinois, Eastern Division *Analyzed issues of market power, market structure, market share, concentration, entry and exit, and antitrust injury.*

For the FTC, Revco's proposed acquisition of Rite-Aid. *Analyzed issues of market power, market* structure, *market share, concentration, entry and exit, and antitrust injury.*

For the Estate of Reginald F. Lewis in Carlton Investments v. TLC Beatrice International Holdings, Inc, Loida Nicolas Newis, as Executrix of the Estate of Reginald F. Lewis, et al. *Analyzed structure of executive compensation and firm and industry performance to determine whether compensation was in compliance with CEO's fiduciary duty.*

Support for Ameritech in defining its position in response to the FCC NPRM implementing the 1996 Telecommunications Act, May 1996,

For Telus of Canada, analyzed economic issues pertaining to access to cable television channel capacity, bottleneck facilities, competition, and cost, November 1996.

Reports of Debra J. Aron, "Pricing Strategy for Cellular Telephone Services," October 1994, November 1995. *Examined consumption patterns of cellular telephone services for demand elasticities and evidence of risk aversion, developed* entirely *new pricing strategies for cellular services in each of six major cellular telephone markets, and estimated the likely revenue effects of the strategy change for each market. Dr. Aron also developed and provided software to the client for estimating the revenue effects and the proposed pricing strategies.*

"An Analysis of the Marketability of a CPI Future" (with Edward P. Lazear), for the Chicago Mercantile Exchange, February 1985.

Report of Debra J. Aron, "Efficient Pricing of Telecommunications Equipment at the University of Chicago," for the University of Chicago, 1985.

As a Professor at Northwestern University, Dr. Aron has supervised numerous student consulting projects in which pricing strategies were analyzed for industries including health clubs, toys, paper products, food products, athletic shoes, and hardware.

PROFESSIONAL ORGANIZATIONS

Member, American Economic Association
Member, Econometric Society
Associate Member, American Bar Association

PERSONAL INFORMATION

Born: March 15, 1957
Los Angeles, CA

July 1998

Appendix C

Ameritech's Further Comments
August 3, 1998
CC Docket No. 95-116: Long-term Number Portability

Demand Forecast Methodology

Database queries made as a result of Long-Term Number Portability (LNP) will be projected by the use of a combination of actual switch call completion data, call completion billing records, reasonable engineering assumptions and interconnecting carrier surveys. All carrier surveys / forecasts provided to Ameritech will be considered confidential and will only be used for network planning purposes, and to price and provide the LNP monthly charge and LNP Query.

Three types of anticipated LNP queries are required in an LNP capable geographic calling area. These are the LNP Monthly Charge queries (Ameritech customer originated calls), LNP Query Service (other carrier originated calls that are routed to Ameritech by N-1 carriers) and Unbundled LNP Database Access queries (other carrier originated calls where the Ameritech LNP database is directly queried for routing information). Query capacity requirements and demand forecasts necessary to implement LNP in the Ameritech region will be calculated as follows:

LNP Monthly Charge:

There are two types of retail LNP queries Location Routing Number (LRN) and Global Title Translation (GTT) queries. The LRN query is launched by an originating or intermediate switch to obtain routing information necessary for call

path route selection and call completion to the correct carrier's switch. The GTT queries are used to route data inquiries which support supplemental services on ported calls such as Credit Card Calling or Calling Name Identification as described in Appendix G.

In order to estimate the volume of calls upon which Ameritech will perform a query as the N-1 carrier, actual call originating peg count traffic data will be obtained from all Ameritech switches during a high day busy hour, e.g., the busy hour on Mother's Day. This data will represent all calls originated from these switches in that given hour. Not all of these calls require an LRN query for call completion and , therefore, should be excluded from the LNP demand forecast. First, a percentage of these calls are completed to interexchange carriers ("IXC") and do not require that Ameritech perform the query. The volume of calls to IXCs will be obtained from Ameritech settlements records. These percentages will vary from switch to switch. Since IXC / interLATA calls do not require an LNP query, the originating peg count will be reduced by this interLATA percentage.

Second, intraswitch calls also do not require a query for call completion. For that reason, Ameritech will obtain traffic peg count data that represents intraswitch calls and will deduct these calls from the remaining originating peg count data.

The remaining traffic count, after calls to IXCs and intraswitch calls have been removed, (interswitch/intraLATA calls) require that Ameritech perform an LRN query for call completion in a portable environment. These busy hour calls that

require an LRN query will be extrapolated to represent the total number of calls requiring a query per month. The per month call data will then be overlaid on the areas where LNP implementation is planned, resulting in a anticipated LNP query count. The assumptions and methodology used to calculate the LNP Monthly Charge queries are listed below:

- All NPA/NXXs will be opened for porting at the beginning of the LNP implementation schedule in which they are planned to be opened.
- Originating busy hour calls will be obtained from all Ameritech switches.
- Partial dial/abandoned calls will be subtracted.
- Engineering traffic data will be used for the calculation. A standard factor is used to determine volumes per year (through study period) that include growth.
- Originated calls, by switch, to IXCs will be subtracted from the base.
- Intraswitch calls will be subtracted from the base.
- Anticipated GTT queries associated with LNP will be added to the base by applying a standard factor that estimates intraLATA interoffice calls that require GTT queries.
- Busy hour volumes represent a faction of the call volumes for the day. A standard factor is applied to the busy hour calls to estimate the daily volume of intraLATA interoffice calls per day.
- Extrapolated daily call volume represents a fraction of the total call volume for the month. A standard factor is applied to the daily volume to calculate the volume per month.
- Query volumes in 1998 represent full implementation of the Metropolitan Statistical Areas (MSAs) in which LNP implementation is planned.
- Query volumes in 1999 represent full implementation throughout the Ameritech region.

LNP Query Service:

Ameritech will base its demand projections for the LNP Query Service on projections and plans received from other carriers and its general knowledge of traffic volumes and usage. This is necessary since the Query Service involves Ameritech performing queries on traffic it receives from other carriers where that carrier has not performed the query itself, or where a carrier elects to access Ameritech's LNP database. As such, Query Service demand depends upon the plans of other carriers. For example, Ameritech may be able to use its traffic data to estimate how much traffic it will receive, but has no way of knowing from its traffic data how much of that traffic will be queried by the N-1 carrier and how much must be queried by it. Ameritech will consider its projected level of query demand, when it determines the allocation of LNP costs to the Query Services. The allocation will be made on the basis of projected utilization of the facility, equipment or software involved based upon the relative demand projections. Also, Ameritech will use unseparated costs to develop a uniform intrastate and interstate rate. As such, Ameritech properly uses combined projected demand for both intrastate and interstate traffic.

Ameritech will develop its demand forecast for Query Service starting with its projections of non-Ameritech terminating access traffic to Ameritech's End Offices and Tandem switches during the relevant period. To calculate the percent of that traffic that would be unqueried, Ameritech will send letters to interconnected carriers asking whether they intend to send unqueried traffic to Ameritech (and if so at what

level). All forecasts will be treated as confidential information and will only be used for network planning and to price and provide LNP, and Query Service.

To augment actual carrier forecast information, Ameritech will estimate demand based upon its knowledge of LNP, and all available information regarding the plans of other carriers. For example, Ameritech will consider which carriers have SS7 capability or are known to be deploying LNP capabilities, in an effort to identify carriers who would likely prearrange with some other carriers to meet their N-1 responsibility (e.g., Illuminet is currently marketing N-1 Query services).

Ameritech's demand forecast will exclude IXCs that will meet their N-1 carrier responsibilities through the use of their own databases and therefore, will not require Ameritech to perform queries on their behalf and other interexchange carriers will use Ameritech's Query Service on either a prearranged or default basis during the tariff period.

Ameritech expects that it will receive little or no unqueried traffic for the three largest interexchange carriers based on (1) the participation of those carriers in the FCC LNP Field Trial in Chicago, and (2) the carriers' statements in the Illinois Commerce Commission's LNP Workshops that they would install their own databases. It also expects that the next three largest interexchange carriers will also send little or no unqueried traffic to Ameritech based upon these carriers' stated plans to implement N-1 query capability in their networks sometime in the second half of 1998.

Ameritech's expects that it will include demand from wireless carriers through 1999 based on (1) the published release time frame of vendor software to implement long-term number portability for wireless carriers, and (2) the fact that wireless carriers are not required to implement number portability until 1999. This expectation is further supported comments and waiver petitions filed with the Commission by wireless carriers stating that they are not yet prepared to implement LNP.

Access billing data will be used to project call volumes of default routed traffic to the Ameritech network from N-1 carriers that do not perform their own queries. This traffic is expected to result in an LNP query being launched by Ameritech in order to complete each call. Access billing data will indicate the total number of calls, by carrier, completed to each Ameritech local switch and which Ameritech tandem it transits. Monthly call data will then be overlaid in the areas where LNP implementation is planned and a total anticipated LNP query count will be derived.

The assumptions and methodology to used to the calculate the LNP Query Service demand are listed below:

- Ameritech will utilize carrier surveys and public information to determine which carriers intend to perform their own queries.
- Traffic from carriers performing their own queries will be excluded from the Ameritech demand forecast.

- The smaller IXC and wireless carriers are expected to require Ameritech query service throughout the study period.

- An estimated factor will be applied to the projected completed messages to determine the volume of failed calls (eg; busy, no answer, etc) upon which a query was performed.

- All terminating traffic on Ameritech tandems from default and prearranged N-1 carriers will require a query, if the involved area has been converted for portability. A growth factor per year will be used to estimate the demand over the study period.

- All NPA/NXXs in the LNP area are opened for porting at the beginning of the scheduled implementation period.

- LNP Query Service projections will include end office queries (i.e. direct trunking arrangements) required to complete calls to ported numbers.

- Some carriers may at some future date meet their N-1 responsibility by installing their own network capability or arranging to use another carrier's database. An estimated factor will be used to decrease the LNP Query Service demand forecast volumes accordingly.

Unbundled LNP Database Access:

Some carriers may elect at some time in the future to provision their switches with LNP conforming switch software and purchase direct access to the Ameritech's LNP databases. The demand forecast for LNP Database Access queries will be based on current database customers, if any, and carrier surveys. Ameritech will also look at the following factors to determine the potential demand forecast for the Unbundled LNP Database Access queries:

- Nationally based interexchange, local exchange, or wireless carriers who want to use one national LNP Database. Since Ameritech only offers a regional database, this demand will be excluded.
- Regional based interexchange, local exchange, or wireless carriers who are or planning to be SS7 capable. It is believed that some carriers that have SS7 and LNP switching software will choose to use a LNP database over default routed traffic. However, it is not clear which vendor they will choose.
- Regional carriers who use another SS7 provider. It is likely that these carriers would choose to use their current provider for SS7 as their LNP database provider, if their provider offers a LNP database solution.
- Carriers who have already arranged with another carrier or third party to meet their N-1 Responsibility will be excluded.
- Carriers who want to diversify their implementation plan with more than one regional LNP Database provider may need to have their volumes prorated.

Appendix D

Ameritech's Further Comments
August 3, 1998
CC Docket No. 95-116: Long Term Number Portability

SS7 Signaling Network

The provisioning of LNP and the Query Services requires the use of the SS7 signaling network to obtain call routing information necessary for call completion. This information is contained in the SS7 query messages transported between switches and the LNP database. Ameritech incurs additional SS7 signaling network costs to accommodate the added volume of traffic placed upon the signaling network as a result of LNP services. Since all of these costs are directly required to provide LNP, they are properly included in the overall cost of LNP services.

This Appendix describes the additions, modifications and augmentations to Ameritech's signaling network that were made solely to implement and provide LNP and Query Services. In each case, Ameritech will explain why the addition, modification or augmentation was necessary to support LNP. With regard to the Service Management System/Service Control Point (SMS/SCP) and Link Monitoring SS7 network components, the additional capital investments and expenses needed to provision LNP and Query Services were obtained from the tracking system which identified and accounted for all direct costs associated with LNP.

With regard to the SSP, STP and Link SS7 network components, the capital investments are obtained from a SS7 cost model used by Ameritech. This cost model is an interactive personal computer (PC) based model that utilizes a capacity allocation approach to developing the forward looking investments for components of the SS7 signaling network. More detail on the SS7 cost development process is provided in Appendix A.

SMS/SCPs

Ameritech has deployed a new dedicated Service Management System (SMS) and several associated pairs of Service Control Points (SCPs) in order to provide LNP. The SCPs are databases that contain the call routing information needed to process LNP queries for ported numbers. The SMS provides for the updating of the information stored in these SCPs. The hardware and operating software for this SCP/SMS system was deployed for the exclusive purpose of processing calls to ported numbers due to the very large volume of LNP generated SS7 traffic. No other service (e.g., 800, voice mail, etc.,) uses this resource, and it would not have been deployed except to provide LNP and the Query Services.

STPs

The Signal Transfer Points (STPs) within Ameritech's network process and route all SS7 signaling messages, including LNP queries. In

essence, they act as the "traffic cop", examining each message and routing it to the appropriate signaling node that should process it. The LNP SCPs are directly accessed by certain STPs via A-links (56Kb/s transmission facilities for forwarding LNP queries).

Additional dedicated link terminations (ports) on the STPs for these SCP links, as well as for additional links to the Service Switching Points (SS7 equipped tandems and end offices) and other STPs were needed to accommodate the significant increase in queries expected from LNP and Query Services. Consequently, the costs for these equipment and facilities are directly related to the provision of LNP and the Query Services.

The introduction of LNP and the Query Services requires a more complex screening process in the STPs because all of the dialed digits, rather than simply the first six digits (NPA/NXX), must now be examined to determine the proper routing. In order to create the capacity to perform this more complex screening function, more memory (software and hardware) within the STPs is required to handle the additional translation tables needed to accommodate the significant increase in 10-digit Global Title Translations (GTTs).

SS7 Links

LNP and Query Services use SS7 links (A-links & B-links) to transport this signaling traffic. These links include those to the dedicated

LNP SCPs, as well as to the Service Switching Points (SSP) at end offices and tandems. Other links needed to carry LNP queries are the inter-STP links (B-links) which route LNP queries from local SS7 clusters to more-distant SCPs. The additional LNP traffic has placed a significant incremental demand on these SS7 links as well.

Ameritech's SS7 network architecture homes the LNP SCPs off of local STPs (LSTPs) located at strategic and diverse points throughout its network. This layout, which has been reviewed and endorsed by experts within the industry, ensures maximum diversity and distribution of the LNP and Query Services query traffic. This arrangement is required to ensure that a fault or overload condition at one mated pair of LNP SCPs does not isolate an entire geographic area, and thereby eliminate the ability to complete calls to ported numbers.

By necessity this required the augmentation of links between STPs serving different areas within the Ameritech region so that LNP queries from, for example, Detroit offices could be routed to the LNP SCP in Elgin, Illinois. Ameritech has not included any costs for adding links to handle future growth of SS7 messages from other services. The introduction of LNP, however, has generated the need for additional links to handle the significant increase in signaling traffic over the SS7 network that will be generated by LNP.

Link Monitoring

Ameritech requires the ability to quickly identify and isolate faults within its SS7 signaling network[1]. Ameritech's existing monitoring system proved sufficient in the past.

However, the expanded format and volume of LNP messages, and the increased complexity of the LNP database architecture rendered the existing system design inadequate and obsolete. The requirement to handle default queries will exacerbate the current situation. The need for a new monitoring system to support LNP became evident shortly after completion of the Illinois (FCC) field trial, when a message looping condition was discovered which totally exhausted the link set capacity on one of the LNP SCPs.[2] This condition would have resulted in the inability to complete calls to ported numbers, for portions of selected geographic areas had it occurred after LNP deployment.

A more efficient and reliable means of monitoring the SS7 links, and trapping, decoding and tracing potentially errored signaling messages was needed to ensure reliability. Ameritech is now installing a new link monitoring system that will quickly and accurately pinpoint congestion and trouble conditions within its signaling network.

---

[1] This concern is shared by all network providers, and is driven in part by the SS7 outage that occurred in the Northeast several years ago.

Although the introduction of LNP was the sole driver in the decision to purchase this new system, it will be used for other applications and will thereby benefit other signaling-based services. Thus, unlike other expenditures discussed in the Appendix, the costs of the new monitoring system have been allocated across all SS7 services, based upon the relative estimated usage[3].

The modifications and additions to these SS7 components were essential to provisioning both LNP and the Query services. The portion of these costs allocated to Query Services is based upon the percent of the estimated Query Service query volume to the total estimated LNP query demand.

---

[2] The actual cause was a null voice mail parameter in the SCP record of a ported test number.
[3] Measured in message octets.

Appendix E
Ameritech Further Comments
August 3, 1998
CC Docket No. 95-116: Long Term Number Portability

Operations Support Systems

Like any other service, LNP requires extensive use of Ameritech's Operations Support System ("OSS") functions. For the most part, OSS functions are not used in the real-time processing of LNP queries, but are instead used to perform the pre-ordering, ordering, provisioning, maintenance and repair, and billing functions for LNP services such as "porting in" or "porting out" a specific telephone number, as well as for LNP query services. Definitions of these OSS functions were set forth by the Commission in its First Report and Order in CC Docket No. 96-98 (11 FCC Rcd 15499, at fn. 1244-1247). Nondiscriminatory access to these functions is a network element required by the Commission's rules (47 CFR 51.319[f]).

Ameritech's OSS functions are used by Ameritech and other carriers to perform LNP-related activities. For example, pre-ordering activity includes checking the Street Address Guide to determine if the location of a customer requesting LNP service is served by an LNP-capable switch. Likewise, ordering activity includes entering a TC's order for LNP, and providing applicable status reports to the ordering TC. Provisioning activity includes processing service orders for LNP so that appropriate translation changes are made in Ameritech's switches and updates are posted to the LNP database. Maintenance and repair activity includes entering and tracking trouble reports and providing applicable status reports to customers and their carriers. Billing activity related to LNP includes recognition of a ported customer's local exchange service provider for

purposes of billing the customer's carrier for query services and settlements purposes. The attached flow charts and text detail the OSS functions used to perform various activities required to implement and provide LNP.

The use of OSS functions to pre-order, order, provision, maintain and bill for LNP services required extensive additions, modifications and capacity augmentations to the facilities, equipment and software that Ameritech uses to maintain its OSSs. These changes were required to ensure that the OSSs had the technical capabilities to process LNP service requests, as well as sufficient capacity to accommodate the anticipated volume of LNP-related transactions.

As explained in Appendix G, none of the OSS additions and modifications listed in this Appendix were required for any purpose other than LNP, and none of them would have been made but for Ameritech's obligation to provide LNP. Moreover, the OSS capacity augmentations discussed in this Appendix were required solely to support incremental OSS loads offered by LNP. These augmentations provided no additional spare capacity to support provision of or growth in non-LNP services; thus, the costs of these additions, modifications and capacity augmentations are properly classified as direct costs for purposes of LNP cost recovery.

Port In Scenario